fusing branches and chambers, are admirably portrayed and their mode of origin from the simple condition of an hypothetical rhagon-type is clearly shown. The spicules have received especial attention and the confusing nomenclature is presented in a table where ninety-eight different types of spicules are described and named in accordance with the views of Sollas, Lendenfeld, Stewart, and Schultze. With only eight exceptions a figure of the spicule accompanies each description and with this table, an average student for the first time, can classify Sponges while the admirable schematic figures of the organisms will help him to understand their structure.

The Sponges are divided as usual into two branches, CALCARIA and INCALCARIA. The former is subdivided into two orders, Homocœlida and Heterocoelida (both adapted from Polejaef); the latter is further divided into two sub-classes, Triaxoniæ (F. E. Schultze) and Demospongiæ (Sollas). The first sub-class includes two orders, Hexactinellida (Zittel, Lendenfeld) and Hexaceratida (adapted from Lendenfeld); the second sub-class includes three orders, Tetractinellida (Marshall) Monaxonida (Ridley and Dendy) and Monoceratida (Lendenfeld). The further divisions are made in accordance with the nature and disposal of the spicules. An improvement in the editing of the volume, although of minor importance, is noted in the presence of the name of the family to which the various genera belong and this cannot fail to help the student.

As with the previous volumes disputed questions are clearly stated and the arguments on both sides are fairly presented, the authors in most cases taking a decided stand upon one side or the other. If a critic wished to hunt for defects in the work he might be successful in the section which treats of the physiology of nutrition; this portion of the volume is not complete enough.

In connection with the taxonomic position of the Sponges, the authors maintain with Hatschek, Perrier and Parker and Haswell that they represent a phylum entirely distinct from all other types. In their opinion one character is sufficient to justify separation from the Coelenterata and from all other groups. This feature is the fact first made out by Delage, that the germ layer which corresponds to the ectoderm of other Metazoa, passes during gastrulation to the interior, where it forms the choanocytes in the walls of the ciliated chambers, while the endoderm layer becomes superficial and forms the definitive external covering. They also state that ontogeny throws no light at all upon the relationships of the group.

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A Memoir on the Palæzoic Reticulate Sponges constituting the family Dictyospongidæ. By JAMES HALL in collaboration with JOHN M. CLARKE. (Memoir II, State Museum New York, 1898 [October, 1899], pp. 350, plates I–LXX, royal 4to. A portion of this work also appeared simultaneously with the same title, in the Fifteenth Annual Report of the State Geologist for the year 1895, Vol. II, pp. 743–984, plates 1–47.)

This volume is practically a continuation of the 'Paleontology of New York,' and had its inception in 1884. In 1890, but 42 species of *Dictyospongidæ* were known, and there are now described and figured all the paleozoic representatives of the living 'glass sponges,' of which there are 128 species. "This wonderful increase is not especially a matter for congratulation, save that it serves to show the amazing diversity of these silicious sponges in late Devonian and early Carboniferous faunas." All but 6 species are American. When the fact is noted that most collections contain but few specimens of these sponges, it is a surprise to learn that 70 species alone are found in the Upper Devonic of New York and Pennsylvania. It is mainly in New York that the great fossil 'sponge plantations' occur, and these have been and continue to be worked by Mr. Edwin B. Hall of Wellsville, to whom belongs the credit of having by far the largest collection of these extinct forms. From some of the New York localities several hundred specimens of a kind have been taken, but usually a single species is found in each or this may be even restricted to one colony.

Conrad (1842), was the first to record these

fossils, regarding his *Hydnoceras* as a cephalopod. In the same year Vanuxem described another form, *Uphantænia*, as a plant, and this was the current interpretation for all the *Dictyospongidæ* until 1881, when Whitfield, from Lower Carbonic material, determined that they were the remains of sponges. Nearly all these fossils are found in sandstone, while the living *Euplectellas* are commonly anchored on muddy bottoms.

The present monograph begins with 'General Observations on the Sponges.' These are followed by sections on the affinities, structure of the skeleton, preservation, and occurrence, of the *Dictyospongidæ*. A detailed review of the bibliography, in which there are 42 entries, is next given, and then come a classification and the descriptions of genera and species. The family *Dictyospongidæ* is here divided into seven sub-families, all new. These are: *Dictyospongiinæ*, *Thysanodictyinæ*, *Calathospongiinæ*, *Physospongiinæ*, *Hyphantæniiæ*, *Hallodictyinæ*, and *Aglithodictyinæ*. Of new genera there are *Dictyospongia*, *Hydriodictya*, *Prismodictya*, *Gonglospongia*, *Botryodictya*, *Tylodictya*, *Helicodictya*, *Rhabdosispongia*, *Ceratodictya*, *Lebedictya*, *Thysanodictya*, *Arystidictya*, *Aclœodictya Griphodictya*, *Calathospongia*, *Clepsydrospongia*, *Roemerispongia*, *Hallodictya* and *Aglithodictya*. *Mastodictya* is another new genus, but is undefined. *Sphærodictya* is proposed to replace in part *Teganium* Rauff, which seems to include heterogeneous material. *Cyathophycus* is considered objectionable, because the name indicates a plant. On this ground Dawson changed it to *Cyathospongia*, a name used earlier by Hall. In this volume, the latter term is replaced by *Cyathodictya*. It is a question whether anything is gained by these changes (*Cyathophycus* to *Cyathodictya*, and *Uphantænia* to *Hyphantænia*).

Hydnoceras Conrad was proposed for 'an extravagant type of orthoceran cephaloped.' This, however, never came into use and is here revived 'not because it was founded on a misconception, but because it perpetuates one' (*sic*). On the other hand *Dictyophyton* was introduced by Hall in 1863, 'at the request of Mr. Conrad * * * to replace the term *Hydnoceras*.' The genotype is *D. newberryi*, which was also accepted for *Thamnodictya* in 1884. Under the rules of nomenclature such changes are not usually permissible, but since *Dictyophyton* 'tends to perpetuate the old and erroneous conception of the algous nature of these fossils' the name may be allowed.

The paleontology of New York serves as the highest expression of the work on American invertebrates, not only from a scientific standpoint, but also in artistic appearance. This volume on the sponges continues the previous standard, in spite of the fact that the preservation of the extinct glass sponges does not permit of much detailed elaboration. From an artistic standpoint, the present monograph is equalled by no other, not even by the elaborate 'Systeme Silurien du Centre de la Boheme' of Barrande. Professor Hall long ago recognized the accurate and artistic draughtsmanship of Mr. George B. Simpson and the ability of Mr. Philip Ast in lithographic work. Few can appreciate the skill and patience of the latter in overcoming technical difficulties. For 50 years New York has nobly supported her workers in pure science, and paleontologists look to that Commonwealth and to Dr. Clarke for a continuance of the splendid series of volumes on the paleontology of the State.

CHARLES SCHUCHERT.

BOOKS RECEIVED.

The International Geography, by seventy authors. Edited by HUGH ROBERT MILL. New York, D. Appleton & Co. 1900. Pp. xx + 1088. $3.50.

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SCIENTIFIC JOURNALS AND ARTICLES.

THE January number (Vol. I., No. 1) of the *Transactions* of the American Mathematical Society contains the following articles: 'Conics and cubics connected with a plane cubic by